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APPLICATION NUMBER: *60/615,888*
FILING DATE: *October 05, 2004*
RELATED PCT APPLICATION NUMBER: *PCT/US05/07261*

Certified by

Jon W. Dudas

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PROVISIONAL APPLICATION FOR PATENT COVER SHEET

This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 CFR 1.53(c).

Express Mail Label No. ER 716649251 US

INVENTOR(S)		
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Additional inventors are being named on the _____ *separately numbered sheets attached hereto*

TITLE OF THE INVENTION (500 characters max):

CATALYST FOR SPEED COOKING OVEN

Direct all correspondence to: **CORRESPONDENCE ADDRESS**

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OR

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ENCLOSED APPLICATION PARTS *(check all that apply)*

☑ Specification *Number of Pages* 5

☑ Drawing(s) *Number of Sheets* 3

☐ Application Data Sheet. See 37 CFR 1.76

☐ CD(s), Number of CDs _____

☐ Other (specify) _____

METHOD OF PAYMENT OF FILING FEES FOR THIS PROVISIONAL APPLICATION FOR PATENT

☑ Applicant claims small entity status. See 37 CFR 1.27.

☑ A check or money order is enclosed to cover the filing fees.

FILING FEE Amount ($): 80.00

☐ Payment by credit card. Form PTO-2038 is attached.

☐ The Director is hereby authorized to charge filing fees or credit any overpayment to Deposit Account Number: _____
A duplicative copy of this form is enclosed for fee processing.

☐ The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government. No.

☐ Yes, the name of the U.S. Government agency and the Government contract number are: _____

SIGNATURE _____ Date OCTOBER 5, 2004

TYPED or PRINTED NAME DAVID A BOLTON REGISTRATION NO. 41627 *(if appropriate)*

TELEPHONE 817-821-3956 Docket Number: _____

USE ONLY FOR FILING A PROVISIONAL APPLICATION FOR PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: **DAVID A. BOLTON & DAVID H. McFADDEN**

Serial Number: **TO BE ASSIGNED**

Filed: **October 5, 2004**

For: **CATALYST FOR SPEED COOKING OVEN**

CERTIFICATION UNDER 35 USC SECTION 122(b)(2)(B)(i) OF NO FOREIGN FILINGS

Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

Sir:

Applicant hereby certifies (through counsel) that the invention disclosed in the above-identified application filed herewith has not, and will not, be the subject of an application filed in another country, or under a multi-lateral international agreement, that requires publication of applications eighteen (18) months after filing; therefore Applicant requests that the subject application not be published under 35 USC Section 122(b)(1).

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Respectfully submitted,

October 5, 2004
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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: **DAVID A. BOLTON & DAVID H. McFADDEN**

Serial Number: **TO BE ASSIGNED**

Filed: **October 5, 2004**

For: **Catalyst For Speed Cooking Oven**

TRANSMITTAL

Box: PROVISIONAL PATENT APPLICATION
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

Sir:

Please file the following enclosed documents in the subject application:

1. This Transmittal with Certificate of Express Mail (2) pages;
2. Provisional Application Cover Sheet (1) page
3. Provisional Application (5) Pages;
4. Drawings (3) pages;
5. Assertion of Entitlement to Small Entity Status (2) pages;
6. Certificate of No Foreign Filing (2) pages;
7. Our check in the amount of $80.00 to cover the Provisional Application Filing Fee; and
8. Our return postcard which we would appreciate you date stamping and returning to us.

EXPRESS MAIL NO. ER 716649251 US
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Date of Deposit: October 5, 2004
By: David A Bolton

Please conduct all correspondence in the above matter with:

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ATTORNEY FOR APPLICANT

Background

(A) Grease Control in High Speed Ovens:

To create a break through in the cooking process, the cooking speeds must be greater than 5 times normal or conventional cooking speeds. Now things that required 20 minutes to prepare in an oven now take just a few minutes. Just-in time cooking is now possible. Commercial food operations can prepare fresh cook on demand and the residential customer can have a quality prepared product in only minutes

In high speed ovens, the rate of grease generation from food products (e.g. proteins) is substantially greater than that of a conventional oven. Its increase is roughly proportional to the cooking speed increase. Therefore, control of grease emissions is a key requirement for high speed ovens.

Grease control is challenging as high velocity airflows tend to entrain a great deal of grease (particles and vapor) into the cooking air stream. Untreated grease creates a number of issues including:

- Rapid soiling of the cavity surfaces/ducts requiring frequent cleaning
- Smoke generation
- Odor transfer between food products (e.g., fish to chicken)
- Vent free operation per indoor air quality standards (e.g., UL197 SB for commercial applications), and consumer demands.

(B) Typical Approaches to Control Grease/Odors

In convection and rapid cook (convection and microwave) oven applications grease control is usually accomplished using

(i) Vent catalyst

(ii) Main convection flow catalyst

(iii) Use of both vent and main catalytic converters

Vent Catalyst: The vent catalyst method places a catalyst material in the oven vent duct which provides a low flow path between the oven cavity and the ambient environment. Typically a small 'bottom" catalytic element consisting of either a screen material or a ceramic honeycomb matrix coated with a catalyst material is placed in the vent tube. The oven vent satisfies several key oven operation needs including:

- Enables the planned escape of hot air from the oven as the heat expands during heating. This eliminates the inadvertent venting of hot oven from

around the door seal which can create a burn hazard or temperature issues for controls located near the door

- During cooking a portion of the moisture evolved from the food product must be vented in order to provide acceptable food surface conditions.
- It provides a controlled flow path in which a smoke/odor control element can be located. This reduces objectionable cooking odors/smoke emissions from the oven.

A vent catalyst is common to most oven designs.

Main Convection Catalyst: For rapid cook oven applications that prepare grease laden foods, the issue of smoke/odor or grease control can be key to customer acceptance. As one can well imagine, rapid grease generation could result in excessive amounts of smoke and foul odors being discharged into the kitchen area when the oven door is opened at the end or the beginning of a cook cycle. Odors/smoke/grease vapors would also be emitted from the oven vent. Finally, the untreated smoke/odor/grease would create a flavor transfer issue as noted above. To remedy these effects, treating the convection air that circulates continuously over the food product via catalytic converter placed in the main air flow has been employed.

Such a clean-up system uses a metal or ceramic substrate to support the catalytic material placed in the main convection flow. Its typical placement is just downstream of the oven cavity in the return duct. The grease laden flow then passes through converter where the grease laden air comes in "contact" with the catalyst resulting is some oxidation of the grease. Given that all of the convection air passes through the converter, the catalytic converter becomes a significant pressure drop element in the blower assisted convection loop. To accommodate the converter is this configuration, the destruction efficiency of the converter is severely limited in order to reduce its pressure drop to acceptable levels. For this configuration, the oven must be operate at temperatures in the 450F in order to reach destruction efficiencies greater than 10%. For low destruction efficiencies, the grease laden air must make many passes through the main catalyst in order to produced good grease control. At 350 F oven temperatures, the catalyst provides little grease removal benefit.

In summary, the employing a catalytic converter where all the convection air passes through it penalizes the system relative to additional pressure drop which increases energy, increases component sizes (e.g., blower motor power, blower wheel diameter for a given rotational speed), and provides poor grease control for lower cook temperatures. In addition, a second vent catalyst may be needed to eliminate objectionable odors and smoke during the cook event.

Invention Discussion: The objective of this invention is a grease control system for rapid cook ovens that

1. Eliminates the need for separate vent air and main convection air catalytic converters

2. Eliminates the convection blower pressure drop penalty (additional power, component sizes,...)

3. Permits effective grease control at lower operating temperatures which produces a more flexible cooking product and reduces long term "stress" on the oven components resulting from higher operating temperatures.

Figure 1 presents a schematic of the subject invention. It consists of two levels of grease control:

- Roof mounted grease particle extractor
- Catalytic converters treating odor, grease vapor and smoke

These elements may be used either independently or together as shown in Figure1.

To manage airborne grease and liquids (particles and vapor), a two stage approach as shown in Figure 1 was created. The first stage is a mechanical separator means that collects grease/liquid particle up stream of the second stage method, a catalytic converter. The mechanical grease filter reduces the quantity of grease associated with the larger non-aerodynamic particles prior to entry into the return ducts. This element is located at the roof line of the cavity where the upward flowing air leaves the cavity. Given the upward flow characteristics of the air leaving the oven, larger grease particles are less likely to be entrained. As such, the mechanical separator design can be simplified. A simple metal grill or mesh can provide sufficient grease separation to minimize grease particles from adhering to the surfaces of airflow ducts. A more conventional baffle filter (convoluted flow path) may also be used. The grease filter also acts as a microwave filter preventing substantial amounts of microwave from leaving the cook cavity and being absorbed in the airflow ducts (loss of useful energy). In addition, minimizing microwave "leakage" into the ducts reduces the construction complexity associated with fabrication of sheet metal parts that are "microwave tight" and it eliminates microwave energy contamination of temperature sensors (output signal from sensor) that may be located in the passage ways.

The second stage catalyst(s) is positioned after the filter and handle both grease vapor and small grease/smoke particles. Our grease catalytic converter approach continuously cleans only a small portion of the air that flows through the oven cavity. Its flow geometry is as follows:

1. Grease laden airflow leaves the oven via an opening in the oven roof—"Return Air"
2. The return air is pressurized via the convection air blower(s)
3. The pressurized air leaving the blower is directed to air discharge plates that create the conflicting airflow pattern in the oven.
4. A small portion of the pressured air leaving the blower discharge is diverted to the inlet of the catalytic converter. – "Bleed Air Stream"

5. The "Bleed Air" passes through the catalytic converter where a substantial amount of the smoke, grease vapors, and small aerodynamic grease particles are oxidized.

6. Cleaner air leaving the converter is either reintroduced into the air stream or is vented form the oven.

By using an effective catalytic converter that oxidizes the majority of grease during a pass, the small bleed air flow continually removes grease generated during cooking. This approach provides excellent grease and odor control if the destruction efficiency of the catalytic converter is greater than 50%. Unlike the catalytic converter in the main flow which does a small amount of grease oxidation on each pass of the total convection airflow, the subject uses only a fraction of this air at any given time to control grease. In addition, a vent function comes without additional hardware, in that, a portion of the cleaner bleed air can be discharged to ambient.

The bleed air is not drawn from the cavity, rather it is configured as a internal cleaning air loop operating off the main convection air stream. Given that the subject invention uses the high pressure air from the blower, the resulting large pressure drop permits the use of sufficient catalytic material needed for the higher destruction efficiency. Space velocities for the catalytic converter range are typically between 60,000 to 120,000 depending on the catalyst material (Pt preferred), grease loading in the air stream and the converter inlet air temperature.

Unlike the placement of the converter in the main flow which imparts a significant pressure drop on the entire circulating convection flow, the subject invention does penalize the air flow system with additional pressure drops. The small bleed air flow can utilize nearly the entire pressure capability of the blower thereby permitting the use of catalytic material needed for a high destruction efficiency (based on one pass through the converter). In addition, the small bleed air positioned catalytic converters are easily installed and accessible as shown in Figure 3. While a system using the main flow converter typically has this element buried in the return duct, the bleed air converters are easily positioned in convenient locations.

Given that the bleed air flows are a fraction of the main convection flow of the oven, a significant inlet air preheat can be achieved. Placing small bleed air heaters at the entrance to the converters can provide substantial improvement in the destruction efficiency of the catalytic converters. Preheaters (see Figure 2) can increase the air inlet temperature by greater than more than 100F. This temperature increase in the bleed air to the converter makes it possible to achieve the desired destruction efficiency with less of the catalyst material. While an oven utilizing a main flow converter has difficulty in cleaning the grease laden air when the oven set point is under 425 F, the preheat function of the small bleed air stream can produce grease control with oven temperatures below 350F. Additional appliance flexibility is achieved by simultaneously permitting lower oven cook temperature setting while providing grease control.

The example shown in Figure 2 presents typical flow rates that a countertop version of our rapid cook technology would utilize. The bleed airflow is about 10% of the total

convection flow and the small preheaters would each provide about 600W of heat for a 100F rise in air inlet temperature. The combined 1200 watts of heating is less than 1/3 of the total convection heat required and is very close to the heat needed to satisfy standby losses of the oven (i.e., heat loss due to conduction, radiation, vent losses to ambient). As such, the preheaters can be the primary oven convection air heaters with the larger (for this example 3000W) main convection heater used to satisfy cooking needs.

We claim an apparatus having all of the features shown in Figures 1-3.

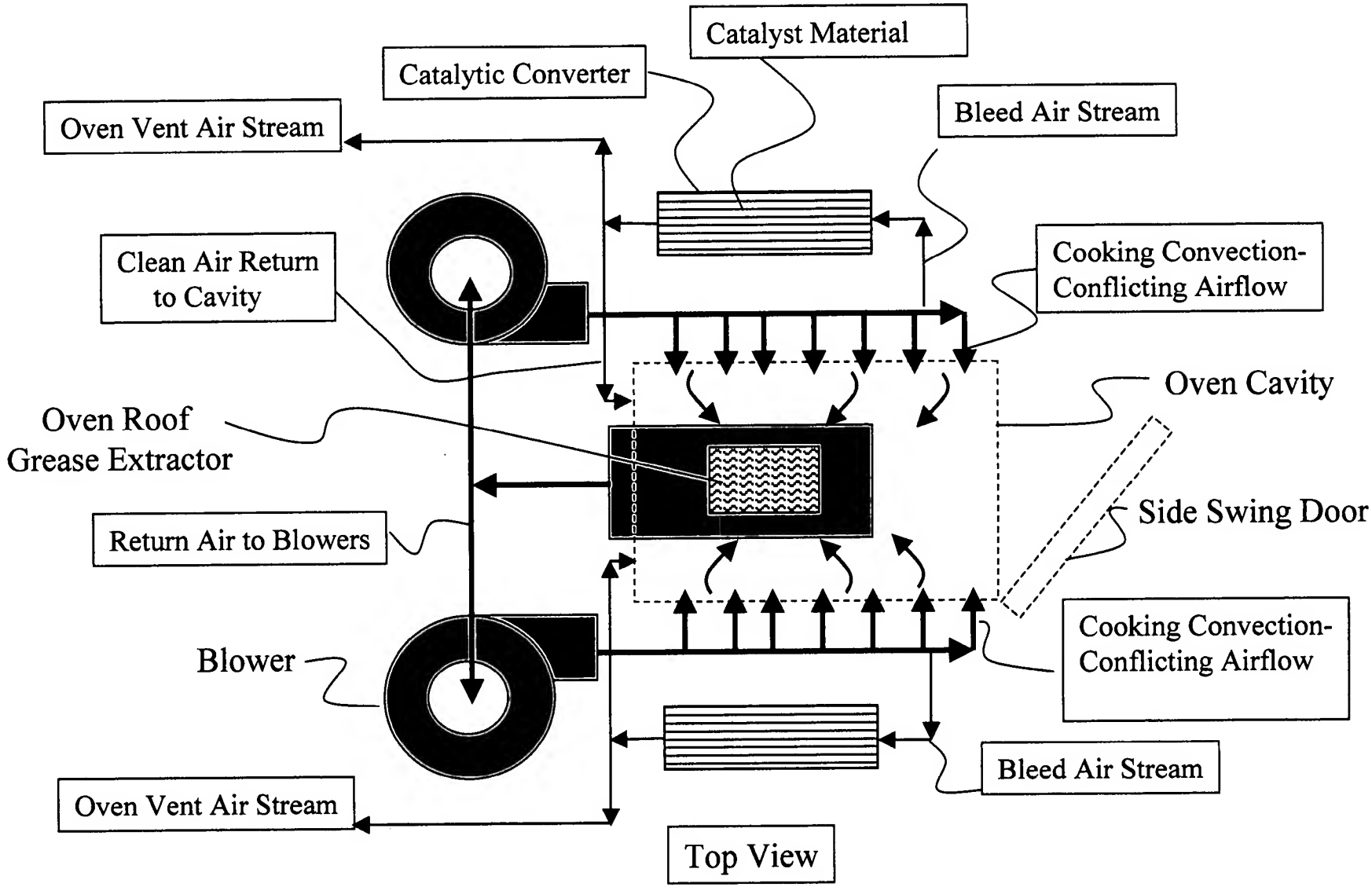

Figure 1: Oven With Low Flow Catalyst Arrangement

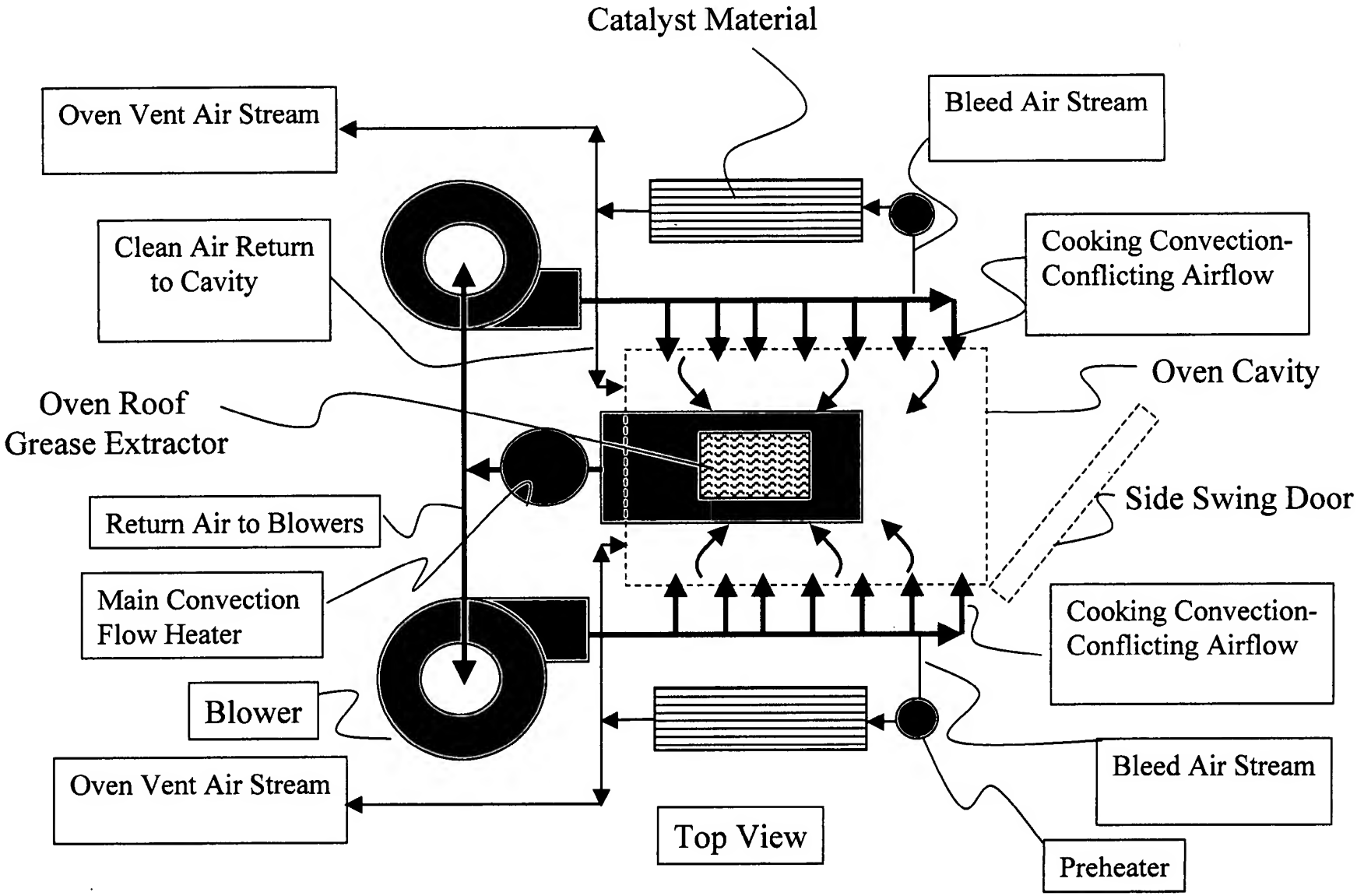

Figure 2: Oven Flow Example with Catalyst Preheat Arrangement

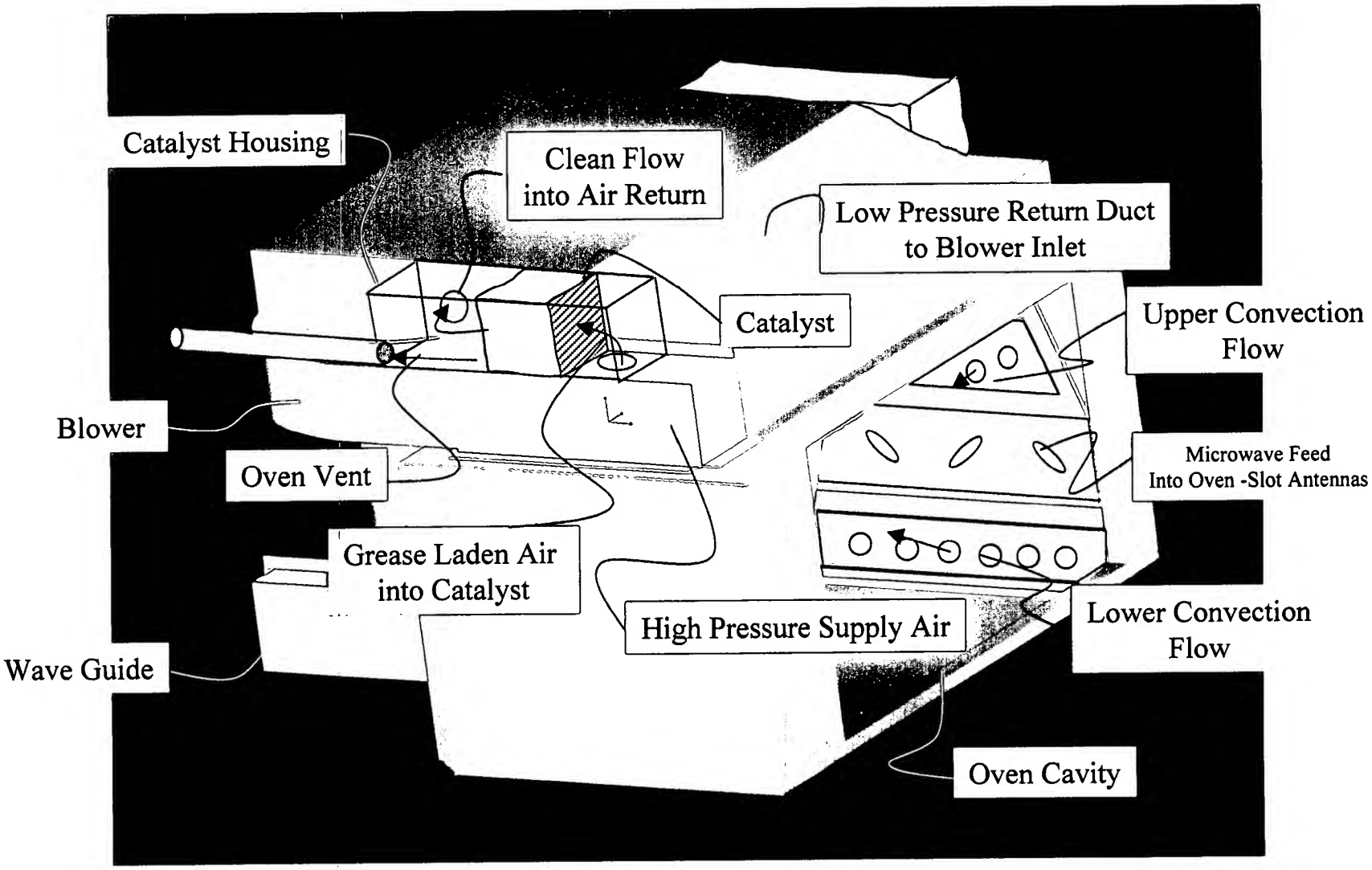

Figure 3 - Catalyst Flow Connection to Oven

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: **DAVID A. BOLTON & DAVID H. McFADDEN**

Serial Number: **TO BE ASSIGNED**

Filed: **October 5, 2004**

For: **Catalyst For Speed Cooking Oven**

ASSERTION OF ENTITLEMENT TO SMALL ENTITY STATUS
UNDER 37 C.F.R. §1.27 (c)

Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

Sir:

Pursuant to 37 C.F.R. 1.27 (2) (c) (i), the undersigned hereby asserts that **GLOBAL APPLIANCE TECHNOLOGIES, INC.** owner by assignment of the entire right, title, and interest in the subject application, is a small entity as defined in 37 C.F.R. § 1.9(d) and is entitled to small entity status for purposes of paying reduced fees under Section 41 (a) and (b) of Title 35, United States Code, to the Patent and Trademark Office with regard to the subject invention.

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Respectfully submitted,

October 5, 2004
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